



## **NASA STTR 2008 Phase I Solicitation**

### **T6 Innovative Technologies and Approaches for Space**

To accomplish the Agency's goals and objectives for a robust space exploration program, innovative technologies and approaches are needed to meet these major challenges for human space explorers. This topic solicits advancing the technologies in communication systems' filters and antennas; new dynamic radiation sensors; better and longer range no-power radio frequency (RF) sensors-tag for identification, position and sensor data; and highly effective algorithms for autonomous robotic handling to increase the flexibility and efficacy of robots deployed to the surface of the Moon and Mars missions. The new technologies being solicited include means to improve operational capabilities; improve crew safety; increase human productivity; reduce the size, weight and power; reduce the Extravehicular Activity (EVA) time required to setup and deploy outposts, habitats, science packages, and others; and abilities to enhance the success of future human exploration missions. The anticipated proposed technologies shall have a dramatic impact on achieving these goals of the Space Exploration Vision. Current on-orbit automated rendezvous and docking (AR&D) capability in low-Earth orbit (LEO) is constrained by sensor and effector mass, power, and accuracy limits. NASA/JSC has developed a GPS receiver specifically to address the sensor constraints. Proposals are sought to develop an AR&D demonstration platform that utilizes two pico-satellites in LEO. Relative GPS will function as the primary sensor in a scenario that will include formation flying along with AR&D. The proposal should address pico-satellite (1) development and construction (volume: 10"x5"x5", mass: 5kg), power system implementation, (2) data downlinking, including ground stations, and (3) maneuvering effector implementation.

## **Subtopics**

### **T6.01 Formation Flying and Automated Rendezvous and Docking**

**Lead Center:** JSC

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#### **Pico-Satellite Automated Rendezvous and Docking Development and Test Platform**

This solicitation seeks to improve the current automated rendezvous and docking (AR&D) technologies by validating the NASA designed GPS receiver in an on-orbit AR&D operational scenario and creating a platform for enhanced AR&D verification platform in the formation flying pico-satellites. First, two pico-satellites must be

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constructed to accommodate the NASA's GPS receiver and other state-of-the-art miniaturized sensors and efforts for a 30 day LEO mission. The pico-satellites must meet strict requirements for mass (less than 5kg), volume (5"x5"x10"), power generation (10W continuous), and space ruggedness (30 day LEO mission).

Phase 1 Requirements: Demonstrate the pico-satellite formation flying platform by 1) exit from a shuttle cargo bay as a single unit; 2) pico-satellite separation once the units have cleared the shuttle cargo bay; 3) maintain a LEO for 30 days; 4) transmit data from the GPS receiver to ground stations.

Phase 2 Requirements: Demonstrate the AR&D technologies by performing 1) exit from launch vehicle 2) maintain a predetermined flight formation for a given period of time; 3) perform a controlled AR&D maneuver; 4) transmit data from the GPS receiver and other sensors to ground stations.